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scription both to magnify it and to indicate that its proper position is that of a preliminary phase in the study of systematic botany."

The work of searching for the affinities of great groups is the crying need of systematic botany to-day. The speaker called attention to the danger of magnifying the importance of certain periods or organs in indicating affinities, and summed up what was said under this head as follows: "I have thus spoken of the study of life-histories to indicate that its chief function lies in the field of systematic botany; to suggest that it take into account development at every period and of every organ, and so obtain a mass of cumulative evidence for safe generalization, and to urge upon those not thoroughly equipped great caution in publication."

The speaker spoke of the necessity of constructing a natural system with easy advance in the knowledge of affinities, as a convenient summary of information, a sort of mile-post, to tell of progress and to direct future effort. The concluding summary was as follows: "The points presented in this consideration of the third phase of systematic botany are that the last and highest expression of systematic work is the construction of a natural system, based upon the accumulations of those who collect and describe, and those who study life histories; that this work involves the completest command of literature and the highest powers of generalization; that it is essential to progress for a natural system to be attempted with every advance in knowledge, and that all the known facts of affinity, thus brought within reach, should be expressed in all systematic literature. In conclusion, I have but to say that I have attempted to indicate the true relation which exists among the different phases of systematic botany; to point out an affinity which there is danger of ignoring, and to maintain that all these departments of work, looking to the same end, are equally important, equally honorable."

THE FARMER AND TAXATION.¹

QUESTIONS of taxation have played a prominent part in the polity of English-speaking communities for many centuries, and they have not been without importance in the history of other civilized countries as well. A history of English taxation would be in no small part a history of the English people itself.

It was a quarrel about taxation between the nobles and King John which led to the granting of the Great Charter, and thus planted the seeds of modern constitutional government. English liberty indeed has been developed chiefly in connection with disputes about taxation. Charles I. owed the loss of his throne and of his head largely to his determination to levy such taxes as he pleased without consulting the great men of his realm. English obstinacy in regard to the principle of taxing the colonies led to the American Revolution and the disruption of the British Empire. It was at bottom a question of taxation which led to the French Revolution, and the turning and overturning of Europe which has hardly ceased even now. And the history of this century on the continent shows how fundamental tax questions are to the welfare and prosperity of modern nations.

Of late the question has become of even more importance, and has acquired a very different aspect from that of former centuries. The disputes about taxation were, down to a recent date, largely of a political nature. They turned, not so much on the amount of the tax or the manner in which it

should be levied, as upon the point who should say whether it should be levied at all or not. The rulers or ruling classes tried to keep the whole question within their own control, and those who were opposed to this were trying to get the right to vote or refuse taxes. Now every civilized country in western Europe and America vests the right to say what taxes should be levied, and how they shall be levied, in the people or their representatives. It is accepted as a definite principle that the people are the sole source of the authority to determine what taxes should be levied.

We have indeed always had that principle accepted in this country, to a greater or less extent, and in all its fulness, ever since the Revolution. People thought formerly that as soon as that principle was accepted tax problems would be solved. But it did not take long to find out how great an error this notion was. Hardly had the principle been accepted as a part of the fundamental law of the country when the representatives of the people found out that they were only at the verge, so to speak, of the question. The political side of the problem had been settled to a certain extent, but that only left room for the economic aspect to appear in sight, with a vast array of the most difficult questions. It soon became evident that under the systems of taxation in existence some people paid more than they ought to, and some paid less. Some classes were taxed but lightly or not at all and others very heavily. Then began the fight between the classes, between those exempted by law and those subjected by law to taxation. This conflict was slowly fought through, and now in nearly all civilized countries there are few classes exempted by law from taxation. But it was soon found that it was not necessary to exempt by law in order to take advantage of circumstances in such a way as to materially lighten one's burdens. Then began another struggle between the various classes as to which could shift the burden of taxation more completely, under the forms of law, to the shoulders of the other. The town was arrayed against the country, the producer against the consumer, the rich against the poor, the laborer against the capitalist, etc. We are still in the thick of this fight, and there is no sign of an end to it. It is raging in all countries alike. Our tax problems are not very different in some of their most important features from the tax problems of England, France, and Germany, and each of these countries can learn something from the experience, the successes and failures, of the others.

The problem is all the more difficult because, even if all parties were willing to do exactly the fair thing, we should still find it difficult to determine exactly what the fair thing is. Where you cannot obtain common consent as to what is fair and proper, we need not expect that private individuals will relax their efforts to get exemptions, and make laws under which they can escape what others may consider their fair share of taxation.

The matter is destined to become more rather than less important, and that from several reasons. In the first place the amount of money to be raised by taxation is destined to increase pretty steadily, if not very rapidly. This fact, of course, makes a bad system of taxation become worse with every increase of the amount. If, for example, we had in this country to raise only a small sum for public purposes, say ten million dollars in all, for federal, state, and local governments, it would not matter much how we raised it. We might have an income tax on all incomes over ten thousand dollars a year, or on all incomes of less than that, or a uniform tax on lands irrespective of their value, or even on polls; and while it might be very unequal, yet the whole

¹ Address before the Section of Economic Science and Statistics of the American Association for the Advancement of Science, at Washington, D.C., Aug. 19-25, 1891, by Edmund J. James, vice-president of the section.

amount would be so slight that it would not be worth while complaining about it. Even such a sum as a hundred million a year could be raised very easily by almost any system of taxation. But when you want to raise seven hundred millions it is a very different matter. A system of taxation which would yield a small sum becomes absolutely insupportable when you attempt to raise a large sum by it.

There are some theorists, it is true, who maintain that all the revenues necessary for public purposes could be raised easily by a land tax, or by an income tax, or by an excise tax. Such people have given little study to the organic nature of the State. In determining how much of a burden an organic body can bear, you must consider not only the weight itself but also its distribution. Take a soldier, for example. Would you measure the burden which he could carry in the field by the amount he could drag in the shape of an iron ball attached to one of his feet, or the amount he could carry in one hand, or suspended from one finger? Of course not. Every one recognizes that a load which would tire a man out completely in a few hours if placed on one part of the body can be carried for an indefinite period if only it be properly distributed. So with taxation. Any single tax presses down and destroys or tends to destroy some one part of the economic body. Increase it and you not only destroy that part but, by sympathy, the whole body economic. Given a system of taxation then, which will yield a certain revenue easily without injuring any part of the body economic, if you double the amount to be raised, you will in all probability make the system absolutely insupportable.

Now this is exactly what we have done in this country. We have in essence the same system of taxation which was in vogue a hundred years ago. Indeed we may say that in all its most important features it is the same as was adopted in England in the time of Queen Elizabeth, for our ancestors brought it with them and adopted it almost without change when they settled the country. In the mean time our industry has changed, our agriculture has changed, we have changed our style of dress. We wear different hats, a better boot and shoe; we drive a better horse, milk a better cow, fatten a better hog, have invented a new plough, invented and utilized the railroad, steamboat, mowing-machine, reaper, self-binder, etc., but we stick to an antiquated system of taxation which was not very good at the time it was adopted and has become worse ever since. If we were willing to abolish the public school system entirely, give up trying to improve the roads, starve the inmates of our jails and alms-houses, tie up our insane to a post until they die of starvation and neglect, go back to the fourteenth century system of sanitation, abolish universal suffrage, and set up a class of nobles and kings to rule over us, perhaps we could get money enough out of the community to serve such public purposes as would then be necessary by the system of taxation which we now have. I take it, however, that we are not going to do any of these things. On the contrary, we propose to have better schools, better roads, take better care of our poor, be more reasonable in our treatment of the insane and criminal classes, establish better conditions of public health, do more to develop our industries,—in a word, we propose to advance and not decline in civilization. All this will require more money than we have now, and a system of public revenue must be established which will not only enable us to raise the sums at present demanded but very much larger sums, and at a less cost of effort.

Think for a moment how enormously the expenditure for public purposes has increased of late years in all civilized

countries. The ordinary expenditures of the Federal Government for the decade 1791–1800 were about four millions of dollars. For the decade 1870–1879 it was more than forty times as much, while the population was only about twelve times as great. In the State of New York the amount raised by taxation rose from twenty millions in 1861 to fifty millions in 1870; in Massachusetts, from eight to twenty-two millions in the same period approximately; and in Ohio, from eleven to twenty-two. In the fifteen years from 1860 to 1875 the total amount raised by taxation rose in Baltimore by 110 per cent; in Boston, 241; Brooklyn, 313; Chicago, 1445; Cincinnati, 377; Detroit, 384; Louisville, 318; Milwaukee, 326; Newark, 558; New York, 430; Philadelphia, 317, etc. For fourteen large cities the amount of increase was 363 per cent, while the population increased only seventy per cent. Now it is plain that a tax system which might have been at least bearable in 1860 was in all probability out of all reason in 1875, when nearly four times the revenue had to be raised by it.

Taking all the cities in Massachusetts, they paid six dollars per head in taxes in 1861 and over seventeen dollars in 1875. The city debts had increased from less than eight dollars per head to over fifty-four per head. Even if we take the period after the war, from 1866 to 1876, and take the average of 130 cities in the United States, including therefore the smaller ones also, it will be seen that the taxes rose from sixty-four to one hundred and thirteen million dollars. They have not declined since, but have all risen at least as rapidly as the population.

This phenomenon is not by any means confined to our own country but is quite as noticeable abroad. The expenses of Vienna rose from thirty-seven to sixty-seven million francs in the years from 1865 to 1874, Breslau from four to eight, Florence from nine to twenty-four, Berlin from eighteen to forty-six. Paris rose from eighty-three to one hundred and ninety-six million francs in ten years. Thirty-two cities of Prussia increased their taxes eighty-three per cent in seven years.

A moment's reflection will convince any of you of the enormous increase in this burden, even if you did not have these figures.

You all know that the expense for schools has become enormously greater than formerly. Every country district must now have its school taught from five to six months in the year by a teacher who gets on the average nearly twice as much as two generations ago. Every little village must have its system of graded schools, and if it gets a trifle larger, must have its high school. We are now calling for manual training in the schools, and we are no longer satisfied with the horrible accommodations for teacher and pupils which used to satisfy our fathers. Our poor-houses must be at least half-way decent places, our jails are vastly improved, etc. In a word, our expenditures are vastly greater, and consequently the sum of money to be raised by taxation. As a result the revenue system has broken down, and there are loud calls for a better one.

Now in deciding upon a system of public revenue, two things are to be kept in view. We must first of all find out where the wealth is that we wish to reach, and second, we must then adopt the best system we can devise to find and tax that wealth. There is no use of adopting specific taxes unless there is something to be taxed.

Now here is just the difficulty in our present condition. Our tax system does not correspond to our industrial conditions. It was devised in all its essential features over three

centuries ago, and has undergone little change. If we except the indirect taxes like customs duties, our present system is based on the idea that the chief wealth of the country is in its agricultural districts, in its farms, and consequently it is adapted to reach the main elements in such a condition of society. But nothing could be further from the truth. It was so a century ago, but has long ceased to be so.

In 1790 there was no railroad in the country, scarcely any banks, few trades, little manufacturing, scarce a dozen corporations in the whole country, no very large cities, and ninety-seven per cent of the people lived in the country. What wealth there was was in the country—in the farms and lands and farm products. A system of taxation based on this fact worked fairly well.

How is it now? Where is the bulk of the wealth of this great country of ours? It is no longer in the country: it is in the cities, in and around which nearly half the population is aggregated. It is no longer in agriculture; it is in railroads; it is in gas companies, in street-car lines, in merchandizing and trading,—everywhere but in farming. The earnings of the railroads of the country during the year 1888 were over one thousand millions of dollars. We have no reports as yet on the earnings of gas companies, electric-light companies, telephone companies, street-car lines, telegraph companies, express companies, sleeping-car companies, manufacturing corporations, standard oil monopoly, cotton-seed oil trust. They mount up into the hundreds of millions every year. The profit of trade in the agricultural products of the country alone amount to more than the total value of those products only a few decades back. In a word, the wealth has been steadily flowing away from the farms and into other forms.

This has come about in two ways: first, by the natural increase of manufacturing industry and of commerce in an age of steam and electricity, which would show relative increase of capital invested in those branches; and second, by the actual fall of late years in all farm values in the old and settled communities incident to the opening up of new fields, which are enabled to compete in the world's market by the cheapening of transportation in railway and steamship service. Not only Dakota and Montana compete in London with the Pennsylvania wheat, but also India, Russia, and even Africa. There has been a great fall of late in the value of farm staples in the world's market, which has depressed the value of farms in all the settled countries,—in England, France, and Germany, as well as in our Eastern States. There are no signs that those prices will go up again, at least in your day and mine.

Africa, South America, India, Russia, and Australia will be opened up faster than the demand for bread-stuffs will increase, and you may be sure that Europe will not pay as high prices for our surplus wheat and corn when it can get cheaper supplies elsewhere. We need expect then no recovery in farm values so far as these depend on the price of staple commodities.

In examining this question of taxation, then, let us impress upon our minds several points: first, that we cannot hope to get money where it is not, no matter how good our system may be; second, that the wealth of the country is no longer in its farms; third, that the present revenue system is based on that supposition, and that consequently our whole revenue system must be radically changed to bring it into harmony with our modern industrial conditions.

No mere tinkering or pottering around with existing taxes is going to help. We must make up our minds to go to the

root of the matter at once; recognize that if we wish revenue we must reach the place where it is, and not try to get it from where it is not.

Before proposing our remedy it is desirable to glance at our present system and its effect. We have already seen that it is inadequate to meet the demands we are making and shall make upon it. It is simply impossible to get adequate revenue from it.

There is, however, another reason why our present revenue system is unsatisfactory besides the mere reason that it can not meet the heavier demands upon it, i.e., than its insufficiency to get the necessary revenue, and that is, that, owing to the great changes in our industry, it has become grossly unjust.

We may characterize the system as a whole as the general-property tax system, i.e., the effort is made to ascertain the valuation of the entire property belonging to every taxable, and then to collect a certain per cent of that valuation for the use of the public. Even if it were possible to ascertain such value, and collect the tax levied upon it, the system would be a grossly unequal one, and undesirable from many points of view. It would tax, for example, the thrifty farmer who had accumulated from his savings a sum sufficient to purchase a small farm in proportion to his thrift and savings; while it would let the extravagant lawyer or physician who makes thousands of dollars every year and lives it all up, go scot-free of all taxation. All those classes who use up their income as they go along would escape taxation, while those who save and invest it in some form of property would have to bear all the burden of taxation. It would, in a word, discourage savings and encourage waste. Such a tax makes no distinction between the people of small property and those of large means.

The true principle of taxation is not every one in proportion to his property, but every one in proportion to his ability; and ability is not measured by possession of property alone, since a man of large means may better afford to give a larger sum than a person of small means a small sum. A general-property tax, moreover, takes no account of whether the property is available for purposes of income or not. A person is taxed upon what he has, irrespective of the fact whether he can get anything out of it or not. And so I might go on and show how unequal and wasteful such a tax is, even if it could be fully assessed and collected; but the fundamental objection to it is that it can never be assessed and collected. To make it even approximately complete you must rely on the declaration of the taxable that he has given a full and true list of his property. A portion of this property can, of course, be seen, such as houses and lands and furniture, implements and tools, pictures, books, pianos, etc. But another class cannot be seen; such are stocks and bonds, notes, mortgages where owned outside of the community, etc., and all other forms of immaterial rights. It is impossible to assess these things except upon the personal declaration of the owner. Now everybody who has looked into the matter at all agrees, I believe, that this cannot be relied upon at all.

All tax commissions which have reported upon this point say that existing laws do not secure such a return. Taxables commit perjury by wholesale in such matters, and think nothing of it. How much of this sort of property escapes taxation can be seen from examining the tax books and reports of any of our leading American cities. We have, of course, no adequate statistics of the relative value of personalty and real estate for any country or part of a country. No one, however, estimates the value of the personal prop-

erty held by the inhabitants of a great city at anything less than the total value of the real estate, and it is my opinion that it is much more. According to the report of the tax commission of the State of New York in 1871, the real estate assessed in that State for the years 1869-70 was more than three and one-half times as valuable as all the personal property owned by citizens of that State. In the city of Brooklyn the valuation of real estate was over ten times as much as that of personal property, Rochester over six times, Buffalo and Albany over four times as much. In the city of New York it was nearly two and one-half times as much. One county in New York reports real estate worth seventy times as much as all the personal property owned by its citizens. Massachusetts, which has perhaps the best enforced law of this kind, does not reach over two thirds of the personal property in the opinion of its tax collectors. Connecticut misses forty per cent. One may almost say that in the large cities much the larger half of the personal property escapes taxation altogether. That means, of course, that the other forms of property are disproportionately burdened. The total personal property of the entire State of New York was returned in 1870 at \$434,000,000. Why, there were at that time in the city of New York alone twenty-five individuals who together probably possessed that sum. The value of the steam railroads in that State in that year was \$300,000,000. In a debate in the constitutional convention of 1867, Mr. Pierpont of New York said that he could name thirty individuals in New York City whose combined personal property exceeded the whole assessment of the State for that year by a very large sum. The whole personal property assessment of the city of Brooklyn against private individuals for the year 1867 was less than ten million dollars. Possibly it had a single citizen who was worth that amount.

But why multiply examples. They are like sands of the sea for multitude. Now, under any such a system as this, those classes who have, comparatively speaking, little personal property are the ones who must bear the burden of taxation. Who are they? Speaking generally, the farmer in the country and the small man in the city; the laborer who has saved up money to buy him a little house, and whose whole property is, therefore, open to the assessor; the farmer who has put all his money into his farm. Who profits by it? The man of means who invests his money in railroads, bank stock, gas companies, etc.

The objection which I have been urging against the general-property tax which forms the backbone of our system would apply more or less to the system at all times; but it is becoming more and more potent as time goes on, owing to the fact above mentioned that the proportion of wealth in an immaterial form, such as stocks and bonds, is steadily increasing. I hardly need to dwell upon this point. You all know how enormously the value of railroads in this country is increasing. Nearly all of it consists of immaterial or personal property; or where it consists of real estate, the value of such real estate cannot be measured by the ordinary standards, but it possesses a value growing out of the peculiar business of the railroad which is rarely reflected as it should be in the tax books. The railroad is the most striking example, but not even is it so important as the aggregate of similar undertakings in other lines of business. Consider for a moment the stock of express companies, telegraph companies, telephone companies, gas companies, electric lighting companies, joint stock banks, manufacturing companies, etc. Indeed, the marked tendency of capital to-day is to assume the corporate form, owing, among other things, to the ease

with which it escapes taxation. This is a phenomenon of comparatively recent date. The corporation first became a prominent feature of our industrial life, as of that of other countries, since 1850. There were, of course, many corporations before that date, and one or two flush periods when nearly everybody took a hand in them, but they were confined to few departments of industry. After 1850 they grew rapidly. In Germany, for example, only 54 are known to have been founded before 1850, while 1,150 have been formed since that time. In Austria there were in 1857 only 58 in all, but they had risen to 731 by 1873. England and America are, however, the classic lands for the development of corporations. In 1844 there were 119 in England, but they had increased to 2,549 in 1862, and by 1886 over 25,000 had taken out charters, though many of them had wound up their affairs, so that only 11,000 were in operation in that year, with a paid up capital of over three thousand millions of dollars.

In this country we have accurate statistics only for a few of the States, and then only in regard to certain formal facts. In Massachusetts, from 1852 to 1863, anywhere from ten to fifty companies were formed each year. The next three years averaged three times as many; then came a long period up to 1880 in which about seventy-five to one hundred were established each year, and since 1880 an enormous number have been formed, rising to 233 in 1889. The total capital of these companies aggregated upwards of \$300,000,000. In the State of Ohio in 1889 over three hundred corporations for manufacturing purposes were organized, and the average for the last ten years has been over two hundred. Now all these things mean, of course, that property of the community is all the while taking on more and more the personal property form, is leaving the country for the city, and that any general-property tax system is becoming more and more unequal owing to impossibility of keeping track of it. With every passing year, then, our present system is becoming more and more untenable, and yet we are not ready to break with it.

There is still another circumstance which should be considered in this connection before leaving it, as having a special relation to the farming classes, and that is the rapidly changing proportion between town and country population. It is easier to avoid personal property taxation in the city than in the country. And thus from this reason also the burden of taxation becomes more unequal. In 1790 only three per cent of the population of the United States lived in cities of 8,000 and upwards. In 1800 (using round numbers), four per cent, in 1810 five per cent, 1830 seven, 1840 nine per cent, 1850 thirteen, 1860 sixteen, 1870 twenty-one, and in 1880 twenty-three. It is not yet known exactly what the new census will show in this respect, as the population of all cities above eight thousand has not been given. But some figures have been given to show that this tendency has steadily increased. In 1880 there were twenty-four cities in the United States with 75,000 inhabitants and over, while in 1890 this number had increased to thirty-four, i.e., while ten years ago about thirteen per cent of the people of the country were living in cities of 75,000 and over, to-day over sixteen per cent are to be found in such cities. The increase of these thirty-four cities, without counting New York, has been almost forty-five per cent, while the general increase in the country as a whole has not exceeded twenty-five per cent. Reports have been also published of forty-two other cities having a population of 20,000 or over. The increase in the seventy-six cities over the population of the same cities in

1880 was about forty-eight per cent. The census may be faulty, but I take it that we shall have to admit that growth of the cities has been much more rapid than that of the country. This being so, it still further tends to increase the burdens of those classes who can least easily conceal their property under a general-property tax system, viz., the farmers.

The rapid growth of the cities, in many cases at the expense of the country, tends, moreover, to leave a continually increasing burden of expense upon the shoulders of the rural districts, which tends to overburden the latter still more.

Under our system of taxation, then, the farmer, using that term for the country districts in general, is at a disadvantage in several respects. In the first place, as we have seen, our method of obtaining public revenue by taxation touches chiefly that form of property which is visible and can not escape the eye of the tax assessor or tax collector; while that which can be hidden, or known only by a general system of registry, such as mortgages, bonds, stocks, etc., practically escapes taxation altogether. Now the farmer has a larger proportion of his property in this form than any other class. If he is thrifty he can buy more land, put up a better class of buildings, get a better breed of stock, use better machinery, etc. Every improvement in his condition, in a word, reflects itself in something visible about the farm, and thus subjects him to heavier taxation. It is very different with the inhabitants of the cities. A wealthy man, of course, occupies as a rule a better house in a dearer neighborhood than a poor man, and to that extent pays more taxes; but as his wealth increases, his house does not necessarily grow better. His scale of living may not increase proportionately. A millionaire is quite as likely to live on as great a scale as one who has ten times the property. As a result, the visible forms of wealth do not increase as rapidly in the case of the wealthy city man as in the case of the country farmer. More and more of the property takes the form of mortgages, bank, railroad, and manufacturing stock, and bonds. All these things escape the eye of the tax assessor, and to that extent relatively lighten the burden of the wealthier classes.

(To be continued.)

NOTES AND NEWS.

THE bacillus of tuberculosis, says *Nature*, is often to be found in places lived in by consumptives. Herr Prausnitz has lately collected the dust in various compartments of trains which often convey patients from Berlin to Meran, and inoculated a number of guinea-pigs with it. Two out of five compartments so examined were found to contain the bacillus; the dust of one rendered three out of four guinea-pigs tuberculous, that of the other, two. The animals were killed after ten to twelve weeks, but in no case was the disease very advanced; the author supposes the number of bacilli to have been but small. The facts, however, seem to point to the necessity of disinfection of such railway carriages, especially the carpets or mats.

— Under the will of Dr. Fothergill (1831), funds were bequeathed to the Society of Arts, London, for the offer of medals for subjects, in the first instance, relating to the prevention of fire. The society now offers a gold medal or £30 for the best invention having for its object the prevention or extinction of fires in theatres or other places of public amusement. In cases where the invention is in actual use, reference should be made to places where it could be inspected. A full description of the invention, accompanied by such drawings or models as are necessary for its elucidation, must be sent in on or before the 31st of December, 1891, to the secretary of the Society of Arts, John Street, Adelphi, London. The council reserve the right of withholding the prize, in case there is nothing, in their opinion, deserving the award, or sufficiently complying with the conditions sent in for competition.

— To the usual well-known ways of stimulating muscles to contraction, viz., electrical, thermal, mechanical, and chemical, M. D'Arsonval has recently added that by means of light (*Nature*, Aug. 20). He could not, indeed, get any contraction in a fresh frog-muscle, when he suddenly threw bright light on it in a dark chamber; but having first in darkness stimulated a muscle with induction currents too weak to give a visible effect, and then suddenly illuminated the muscle with an arc light, the muscle showed slight tremulation. Not thinking this conclusive, however, M. D'Arsonval attached a muscle to the middle of a piece of skin stretched on a funnel, and connected the tube of the funnel, by means of a piece of india-rubber tube, with the ear. The muscle being now subjected to intense intermittent light, he heard a tone corresponding to the period of illumination, and this ceased when the muscle was killed with heat. Arc light was used, which was concentrated by a lens and passed through an alum-solution to stop the heat rays.

— From a recent issue of *Nature* we learn that M. Raspail has lately called attention in the Zoölogical Society of France to the serious diminution of birds in that country through destruction of their nests. Some insectivorous species are becoming very rare, while the ravages of parasites on useful plants are extending. Boys, of course, do a great deal of the mischief; and of the various animals which attack nests (the squirrel, the hedgehog, the dormouse, the magpie, etc.), M. Raspail regards the cat as the worst offender. On a recently wooded property of about seven acres he observed last year as follows: Out of thirty-seven nests, carefully watched, only eight succeeded; twenty-nine were destroyed, fourteen of these by the cat, though effort had been made to ward off this insatiable marauder. On a large property in the centre of a village the owner had about eighty cats annually caught in traps. The place having lately changed hands, the gardeners estimate that more than one hundred nests were destroyed last year, three-fourths of these by cats. M. Raspail advocates a rigorous application of the law for protection of insectivorous species, the disqualification of the cat as a domestic animal, and the giving of prizes to foresters and others for destruction of all animals which prey on eggs and young in the nest.

— Tobacco fermentation, a very essential process, is brought about by firmly packing ripe tobacco in large quantities. *Nature* states that it had been generally supposed that the fermentation is of purely chemical nature, but Herr Suchsland, of the German Botanical Society, finds that a fungus is concerned in it. In all the tobaccos he examined, he found large quantities of fungi, though of only two or three species. Bacteriaceæ were predominant, but Coccaceæ also occurred. When they were taken and increased by pure cultivation, and added to other kinds of tobacco, they produced changes of taste and smell which recalled those of their original nutritive base. In cultivation of tobacco in Germany it has been sought to get a good quality, chiefly by ground cultivation and introduction of the best kinds of tobacco. But it is pointed out that failure of the best success may be due to the fact that the more active fermenting fungi of the original country are not brought with the seeds, and the ferments here cannot give such good results. Experiments made with a view to improvement on the lines suggested have apparently proved successful.

— Experiments in various methods of seeding wheat have been conducted for a series of years at the Ohio Experiment Station, with the following results: In the average of four years' experiments, wheat covered one inch or less has produced at the rate of thirty-four bushels per acre, that covered two inches has produced thirty-five bushels, and that covered three inches thirty-four bushels. Judging from a smaller number of experiments it does not seem advisable to sow deeper than three inches. In the average of six years, wheat sown with the roller-press drill has yielded about eight per cent more than that sown with the ordinary drill. More or less increase has followed the roller-press in almost every season, but a single trial has given results unfavorable to the use of the common roller after seeding. Broadcast wheat has this year yielded about the same as that drilled; but in